

WHAT IS CLAIMED IS:

1. A projection apparatus for forming an image frame on a display surface, wherein the image frame comprises a two-dimensional array of pixels, the apparatus comprising:
 - (a) a projector for directing an image-bearing beam toward the display surface, comprising:
 - (i) a laser light source;
 - (ii) an image modulator for modulating said laser light source to form said image-bearing beam, according to image data;
 - (iii) projection optics for projecting said image-bearing beam toward the display surface to form the image frame;
 - (b) a camera for obtaining a sensed pixel array by sensing the two-dimensional array of pixels of the image frame formed on the display surface by said image-bearing beam;
 - (c) a control logic processor for comparing said sensed pixel array with corresponding said image data for the image frame to identify any portion of said image-bearing beam that is obstructed from the display surface and for disabling pixels within said obstructed portion of said image-bearing beam for at least one subsequent image frame.
2. A projection apparatus according to claim 1 wherein said image modulator is taken from the group consisting of GEMS devices and GLV devices.
3. A projection apparatus according to claim 1 wherein said image modulator is taken from the group consisting of DMD and LCD area spatial light modulators.

4. A projection apparatus according to claim 1 further comprising a scanner for forming the two-dimensional array of pixels from said image-bearing beam.

5. A projection apparatus according to claim 1 wherein said control logic processor disables pixels within said obstructed portion of said image-bearing beam by controlling said image modulator.

6. A projection apparatus according to claim 1 wherein said camera comprises a charge-coupled device.

7. A projection apparatus according to claim 1 wherein said camera comprises a CMOS sensing device.

8. A projection apparatus according to claim 1 wherein said control logic processor applies a motion detection algorithm for identifying said obstruction of said portion of said image-bearing beam.

9. A projection apparatus according to claim 1 wherein said control logic processor applies a facial recognition algorithm for disabling pixels of said obstructed portion of said image-bearing beam.

10. A projection apparatus according to claim 1 wherein said control logic processor applies a red-eye detection algorithm for disabling pixels of said obstructed portion of said image-bearing beam.

11. A projection apparatus for forming an image frame on a display surface, wherein the image frame comprises a two-dimensional array of pixels, the apparatus comprising:

- (a) a projector for directing an image-bearing beam toward the display surface, comprising:

- (i) a laser light source;
 - (ii) an image modulator for modulating said laser light source to form said image-bearing beam as a line of pixels, according to image data;
 - (iii) projection optics for projecting said image-bearing beam as a series of scanned lines toward the display surface to form the image frame;
- (b) a camera for obtaining a sensed pixel array by sensing the two-dimensional array of pixels of the image frame formed on the display surface by said image-bearing beam;
- (c) a scan control logic processor for comparing said sensed pixel array with corresponding said image data for the image frame to identify any portion of said image-bearing beam that is obstructed from the display surface and for disabling pixels within at least said obstructed portion of said image-bearing beam for at least one subsequent image frame.

12. A projection apparatus according to claim 11 wherein said image modulator is taken from the group consisting of GEMS devices and GLV devices.

13. A projection apparatus according to claim 11 wherein said scan control logic processor disables pixels within said obstructed portion of said image-bearing beam by controlling said image modulator.

14. A projection apparatus according to claim 11 wherein said camera comprises a charge-coupled device.

15. A projection apparatus according to claim 11 wherein said camera comprises a CMOS sensing device.

16. A projection apparatus for forming an image frame on a display surface, wherein the image frame comprises a two-dimensional array of pixels, the apparatus comprising:

- (a) a projector for directing a multicolor image-bearing beam toward the display surface, comprising:
 - (i) an image generation system comprising:
 - (1) a plurality of imaging laser light sources, each imaging laser light source having an imaging wavelength; and,
 - (2) for each said imaging laser light source, an image modulator for modulating light from said imaging laser light source to form a monochrome image-bearing beam according to image data;
 - (ii) color combining optics for combining said monochrome image-bearing beam from each imaging laser light source to form a multicolor image-bearing beam;
 - (iii) projection optics for projecting said multicolor image-bearing beam toward the display surface to form the image frame;
- (b) a camera for sensing an obstruction between said projector and the display surface by detecting a reflected light from the display surface, said reflected light having a reflected wavelength not identical to any of said imaging wavelengths; and,
- (c) a control logic processor for defining an obstructed area of the display surface according to said obstruction sensed by said camera and for disabling corresponding said image data to each said image modulator, blanking the multicolor image beam over said obstructed area thereby.

17. A projection apparatus according to claim 16 further comprising a radiation source directed toward the display surface for providing said reflected light.

18. A projection apparatus according to claim 16 wherein said reflected light originates from a radiation source on said projector.

19. A projection apparatus according to claim 16 wherein said reflected light originates from ambient light.

20. A projection apparatus according to claim 17 wherein said radiation source is an IR source.

21. A projection apparatus according to claim 16 wherein said image modulator is taken from the group consisting of GEMS devices and GLV devices.

22. A projection apparatus according to claim 16 wherein said image modulator is taken from the group consisting of DMD and LCD area spatial light modulators.

23. A projection apparatus according to claim 16 further comprising a scanner for forming the two-dimensional array of pixels from said multicolor image-bearing beam.

24. A projection apparatus according to claim 16 wherein said camera comprises a charge-coupled device.

25. A projection apparatus according to claim 16 wherein said camera comprises a CMOS sensor device.

26. A method for forming successive image frames on a display surface, wherein each image frame comprises a two-dimensional array of pixels, the method comprising:

- (a) forming an image frame on the display surface, comprising:
 - (i) energizing at least one laser light source;

- (ii) modulating said at least one laser light source and forming said image-bearing beam, according to image data;
- (iii) projecting said image-bearing beam toward the display surface;
- (b) obtaining a sensed pixel array by sensing the two-dimensional array of pixels of the image frame formed on the display surface by said image-bearing beam;
- (c) comparing said sensed pixel array with corresponding said image data for the image frame and identifying any portion of said image-bearing beam that is obstructed from the display surface; and,
- (d) disabling pixels within at least said obstructed portion of said image-bearing beam for at least one subsequent image frame.

27. A method for forming an image frame according to claim 26 wherein the step of modulating said at least one laser light source comprises the step of modulating a GEMS device.

28. A method for forming an image frame according to claim 26 wherein the step of modulating said at least one laser light source comprises the step of modulating a GLV device.

29. A method for forming an image frame according to claim 26 wherein the step of modulating said at least one laser light source comprises the step of modulating a digital micromirror device.

30. A method for forming an image frame according to claim 26 further comprising the steps of:

- (a) sensing an outline of an obstruction to said image bearing beam; and,
- (b) after a predetermined time interval, re-enabling pixels outside said outline.

31. A method for forming an image frame according to claim 26 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a motion detection algorithm.

32. A method for forming an image frame according to claim 26 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a facial recognition algorithm.

33. A method for forming an image frame according to claim 26 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a red-eye detection algorithm.

34. A method for forming an image frame on a display surface, wherein the image frame comprises a two-dimensional array of pixels, the method comprising:

- (a) directing a multicolor image-bearing beam toward the display surface, comprising:
 - (i) providing a plurality of imaging laser light sources, each imaging laser light source having an imaging wavelength;
 - (ii) for each said imaging laser light source, modulating light from said imaging laser light source and thereby forming a monochrome image-bearing beam according to image data;
 - (iii) combining said monochrome image-bearing beam from each imaging laser light source and forming a multicolor image-bearing beam;
 - (iv) projecting said multicolor image-bearing beam toward the display surface and forming the image frame;
- (b) sensing an obstruction between said projector and the display surface by detecting a reflected light from the display surface, said reflected light having a reflected wavelength not identical to any of said imaging

wavelengths; and defining an obstructed area of pixels of the display surface according to said obstruction; and,

(c) disabling corresponding said image data for said obstructed area of pixels corresponding to each said imaging laser light source, blanking the multicolor image beam over said obstructed area of pixels thereby.

35. A method for forming an image frame according to claim 34 wherein the step of modulating said at least one laser light source comprises the step of modulating a GEMS device.

36. A method for forming an image frame according to claim 34 wherein the step of modulating said at least one laser light source comprises the step of modulating a GLV device.

37. A method for forming an image frame according to claim 34 wherein the step of modulating said at least one laser light source comprises the step of modulating a digital micromirror device.

38. A method for forming an image frame according to claim 34 further comprising the steps of:

- (a) sensing an outline of an obstruction to said image bearing beam; and,
- (b) after a predetermined time interval, re-enabling pixels outside said outline.

39. A method for forming an image frame according to claim 34 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a motion detection algorithm.

40. A method for forming an image frame according to claim 34 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a facial recognition algorithm.

41. A method for forming an image frame according to claim 34 wherein the step of identifying any portion of said image-bearing beam that is obstructed further comprises the step of applying a red-eye detection algorithm.

42. A method for forming an image frame according to claim 34 further comprising the step of directing a radiation source toward the display surface for reflection to camera (20).

43. A method for forming an image frame according to claim 42 wherein the step of directing a radiation source toward the display surface comprises the step of energizing a near-IR source.